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Fluid Mechanics of Cellulose Fiber Suspensions Using MRI ROBERT POWELL, DAVID LAVENSON, EMILIO TOZZI, University of California Davis, MICHAEL MCCARTHY, University of California — Efficient processing of fibrous biomass requires understanding the mechanics of fiber suspensions having large particle sizes of biomass particles, fast settling, and entanglements. Direct imaging of velocity profiles using magnetic resonance imaging provides a way of characterizing flow in the presence of such non-idealities. We found a strong influence of fiber length, concentrations and flow rates on velocity profiles and pressure drops. We map different regions in the concentration-velocity plane that serve as a guide to decide whether or not to use generalized newtonian rheological models. The concentration effects were best described by the use of a crowding number, with large changes in pressure and velocity profiles occurring in a narrow range of crowding numbers. Qualitative differences between the behavior of the long fibers and the short and medium fibers demonstrate a strong effect of fiber aspect ratio on rheology.

Robert Powell
University of California Davis

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